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(54) **SYSTEM AND METHOD FOR
DISTRIBUTION OF 3D SOUND**

H04R 1/406; H04R 2201/401; H04R
3/005; H04R 2499/13; H04R 5/02; H04R
5/04; G01C 21/265; G01C 21/3629;
G10L 13/043; B60Q 9/00

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See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

6,243,476 B1 * 6/2001 Gardner H04S 1/007
381/1
2003/0095669 A1 * 5/2003 Belrose G11B 19/025
381/56

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FOREIGN PATENT DOCUMENTS

EP 2405670 A1 1/2012
EP 2700907 A2 2/2014
WO 2013101061 A1 7/2013

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OTHER PUBLICATIONS

Extended European Search Report Dated Sep. 25, 2014, Application
No. 14163173.9-1557, Applicant Volvo Car Corporation, 7 Pages.

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B60Q 9/00 (2013.01); **H04R 5/02** (2013.01);
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CPC G06F 3/011; G06F 3/012; H04S 7/302;
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(57) **ABSTRACT**

A method and system for distribution of 3D sound in a
vehicle comprising two speakers arranged spaced apart in
close vicinity of a head of a vehicle operator. The vehicle
operator can look in multiple directions, and the system for
distribution of 3D sound comprises means to determine at
least one of angle and gaze direction of the head of the
vehicle operator. Furthermore, the distribution of the 3D
sound is based on the determined angle or gaze direction of
the head of the vehicle operator.

19 Claims, 6 Drawing Sheets

